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Once-a-Day Versus Twice-a-Day Feeding for Dairy Cows¹

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INTRODUCTION

Dairy farmers generally make it a practice to feed their milking cows twice a day. Under most conditions the cows are kept in stanchion barns during the winter months, and grain and roughage feeds are placed in their mangers in the morning and again in the afternoon. Some dairymen also give the cows an additional light feeding of hay at night. On the other hand, in sections where hay is plentiful it is often fed in racks where the cows can eat at will.

During the grain-shortage period in 1947-48, various authorities recommended that cows be given a fresh supply of hay or roughage at frequent intervals throughout the day, in the belief that more frequent feeding would increase the amount of roughage consumed and thereby save grain. Others have advocated feeding only once a day instead of twice a day, as a means of saving labor.

Few data from carefully controlled experiments are available which show the relative amount of hay and other feeds consumed, or the amount of labor required, when cows are fed twice a day as compared with once a day. Results reported by a commercial feed company from experiments on its own research farm indicate a substantial saving of labor, without a reduction in feed consumption or milk production,

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when the herd was changed from twice-a-day feeding to once-a-day feeding.³

During the winter of 1947-48, the Bureau of Dairy Industry conducted an experiment at the Huntley, Mont., Field Experiment Station to compare the effect of once-a-day feeding with twice-a-day feeding on hay consumption, total feed consumption, milk production, and labor requirements. This report gives the results of the experiment.

THE EXPERIMENT

Ten Holstein cows were divided into two groups of comparable age, weight, and stage of lactation. One group received all their day's feed (grain, alfalfa hay, and corn silage) in one feeding in the morning; the other group received the day's feed in two allotments—half in the morning and half in the afternoon.

The double reversal plan of experimentation was followed, and the experiment covered a period of 150 days. The five cows in group A were first on twice-a-day feeding for 50 days, then on once-a-day feeding for 50 days, and then again on twice-a-day feeding for 50 days. The five cows in group B were fed in the reverse order. The first 10 days were considered a preliminary period for each group, and a 10-day change period was allowed between reversals. Hence, data for only 40 days in each 50-day period were used in comparing the results. Records of hay consumption, total feed consumption, milk production, and live weight were kept on each cow, and the data have been summarized by 10-day periods.

Prior to the start of the experiment the 10 cows were housed in a pen barn, which had a dirt floor bedded with straw, and they had become accustomed to eating alfalfa hay at will from racks in the barn lot. During this experiment, however, they were housed in a stanchion barn. The stall floors were of concrete covered with wooden platforms, but were bedded with straw.

The cows were in the stalls continuously, except for four 1- to 3-hour periods daily when they were in the yards for exercise. In the yards they had access to water and a mineral mixture composed of salt and bonemeal. The yards were kept well bedded and they afforded the cows a dry, comfortable place to rest or exercise.

The daily routine was as follows: At 4 a. m. the cows were turned into the yards while the feed was being weighed and placed in their mangers; at 5 a. m. they were returned to the stalls, where they were milked and allowed to eat until 10 a. m. They were then in the yards from 10 a. m. until 1 p. m.; in the stalls from 1 p. m. until 4 p. m.; in the yards from 4 p. m. until 5 p. m.; in the stalls from 5 p. m. until 7 p. m., during which time they were milked (and fed if on twice-a-day feeding); and in the yards from 7 p. m. until 8 p. m. They were then in the stalls from 8 p. m. until 4 a. m. the following morning. On the average, they spent 18 hours in the stalls and 6 hours in the yards.

All cows were fed grain at the rate of 1 pound for each 4 pounds of daily milk production, regardless of whether they were fed once a day or twice a day. Adjustments in the amount of grain fed were

³ BECHTEL, H. ERNEST. FEED COWS ONCE A DAY—SAVE LABOR. *Successful Farming* 45 (11) : 139, 148-151, illus. 1947.

made at 10-day intervals. The grain mixture consisted of 800 pounds of barley and 300 pounds each of oats, mill feed, and soybean meal. The calculated digestible crude protein content of the grain mixture was 15.3 percent, and the total digestible nutrient content was 76.9 percent.

Each cow received 30 pounds of corn silage daily, except during a 12-day period when sugar beet-top silage was fed instead. The beet-top silage was limited to 25 pounds a day because of its laxative effect. The daily offering of alfalfa hay for each cow was based on the amount she actually consumed the day before, the amount being adjusted so as to keep the refusal of hay to less than 10 percent of the amount offered. Weights were kept of the amount of hay fed and the amount refused in each 24-hour period.

All cows in the experiment were milked twice a day at 12-hour intervals—that is, at 6 a. m. and at 6 p. m. Each milking was weighed and butterfat tests were run over 2-day periods at intervals of 10 days. Milking was done with a mechanical milker.

Individual body weights were taken for 3 consecutive days at the beginning and at the end of each 50-day period. Intermediate single daily weights were taken at 10-day intervals.

The time required to feed each group was recorded daily. This record was for the actual time used in feeding the cows, and did not include the time required to clean out the mangers and weigh the feed refused each day.

DISCUSSION OF THE RESULTS

MILK PRODUCTION

Table 1 gives the average daily milk production, feed consumption, and body weight per cow by 40-day periods under both systems of feeding. Figure 1 shows the average daily milk production and hay consumption per cow by 10-day periods, under both systems.

The cows in group A (fig. 1) started off at a level of 57.9 pounds of milk a day for the first 10-day period, following the preliminary 10-day period, on twice-a-day feeding. This level was reasonably well maintained during the following 30 days, but dropped to 50.2 pounds when the group was first shifted to once-a-day feeding and to 46.1 pounds for the fourth 10-day period. Some of this decline was due to the advanced stage of lactation. During the final 40-day period, when the group was again on twice-a-day feeding, there was a further steady decline in production. The rather pronounced drop to an average of 37.2 pounds a day during the last 10 days, although reflecting the advanced stage of lactation of the group, was probably due also to an acute case of mastitis in one of the cows.

To equalize the effect of the stage of lactation in group A, the average milk production for the two 40-day periods on twice-a-day feeding was compared with the production for the intermediate 40-day period on once-a-day feeding (table 1). On this basis of comparison, the cows in group A averaged 47.1 pounds of milk a day on twice-a-day feeding as compared with 44.6 pounds on once-a-day feeding. This is an increase of 5.6 percent in favor of twice-a-day feeding.

TABLE 1.—Average body weights, feed consumption, and milk production by 40-day periods for two groups of cows fed once a day and twice a day

GROUP A (5 COWS)

Period and times fed per day	Average body weight per cow		Average daily feed consumption per cow			Average daily production per cow of 4-percent fat-corrected milk
	Initial	Final	Alfalfa hay	Corn silage	Grain	
First 40-day period (fed twice a day)-----	<i>Pounds</i> 1, 443	<i>Pounds</i> 1, 377	<i>Pounds</i> 16. 8	<i>Pounds</i> 27. 6	<i>Pounds</i> 14. 8	<i>Pounds</i> 54. 1
Second 40-day period (fed once a day)-----	1, 377	1, 414	14. 8	30. 0	12. 9	44. 6
Third 40-day period (fed twice a day)-----	1, 414	1, 409	17. 1	30. 0	11. 9	40. 1
Average of first and third periods (fed twice a day)-----	1, 429	1, 393	17. 0	28. 8	13. 4	47. 1

GROUP B (5 COWS)

First 40-day period (fed once a day)-----	1, 405	1, 345	15. 6	28. 4	15. 1	54. 9
Second 40-day period (fed twice a day)-----	1, 345	1, 379	17. 8	30. 0	13. 9	48. 2
Third 40-day period (fed once a day)-----	1, 379	1, 393	17. 9	30. 0	11. 1	36. 1
Average of first and third periods (fed once a day)-----	1, 392	1, 369	16. 8	29. 2	13. 1	45. 5
Average of both groups: ¹						
Twice-a-day feeding---	1, 387	1, 386	17. 4	29. 4	13. 7	47. 7
Once-a-day feeding----	1, 385	1, 392	15. 8	29. 6	13. 0	45. 1

¹ Average of periods 1 and 3 of one group plus period 2 of the other group, divided by 2.

The cows in group B (fig. 1), starting on once-a-day feeding, maintained their average daily production until the fourth 10-day period. During the next 40-day period, when they were on twice-a-day feeding, they showed less tendency to decline in production; but when they were changed back to once-a-day feeding for the final 40-day period, they showed a decided and continued drop in level of production. Advanced stage of lactation undoubtedly accounted for much of this drop.

When the first and last 40-day periods for group B are averaged (table 1), the average milk production per cow is 45.5 pounds a day, as compared with 48.2 pounds for the intermediate 40-day period on twice-a-day feeding. This is an increase of 5.9 percent for twice-a-day feeding.

The production data for both groups were combined on the basis of the system of feeding, and the milk production on both systems

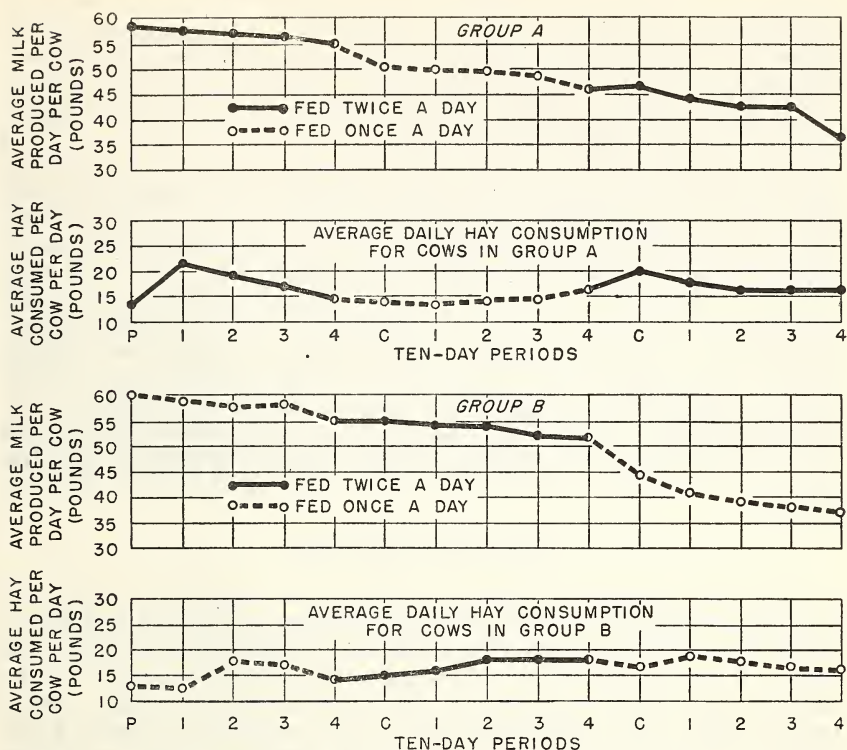


FIGURE 1.—Average daily milk production and hay consumption per cow by 10-day periods, for both groups of cows. (P=preliminary period; C=change period.)

was compared. On twice-a-day feeding the average daily production was 47.7 pounds, as compared with 45.1 pounds on once-a-day feeding (table 1).

HAY CONSUMPTION

It will be observed that the cows in group A, starting on twice-a-day feeding, consumed more hay per cow per day in both periods on twice-a-day feeding than when they were fed only once a day (table 1). The cows in group B, starting on the reverse schedule, reacted somewhat unexpectedly in that they consumed slightly more hay during the final period on once-a-day feeding than they consumed during the intermediate period on twice-a-day feeding.

Combining the data from both groups according to the system of feeding shows that the cows consumed 17.4 pounds of hay per cow per day on twice-a-day feeding and 15.8 pounds on once-a-day feeding. This is a difference of 1.6 pounds of hay per cow per day, or approximately 10 percent more hay consumption on twice-a-day feeding.

NUTRIENT CONSUMPTION

In view of the fact that the two groups of cows were so closely balanced in age, stage of lactation, and body weight, and that the con-

sumption of feeds other than hay was so nearly the same for both groups, the small differences are not significant. Analysis of the data shows that both groups consumed somewhat less nutrients than they required for maintenance and production. This did not result in any particular loss in body weight, however, since on the average the initial and final body weights are quite close.

As previously pointed out, all the cows had been kept in a pen barn, with a bedded dirt floor, before they started on this experiment and they were not accustomed to being in stanchions for long periods. The cows were large and the stalls were too small for their comfort. Some of them would not lie down in the stalls at first, but would wait until they were turned out into the yard. Some became somewhat stiff and lame, probably because they would not lie down as much as they should have. One cow in each group had mastitis for short periods. It was also observed that the cows that were fed only once a day became unduly excited when the afternoon feed was brought in for the other group. While these conditions may have affected the results of this experiment, a comparison of the records indicates that the abnormal conditions were about equally distributed between the two groups.

LABOR REQUIREMENTS

The labor recorded was for the actual time required to bring the feed to the cows, from points common to both groups, and to feed them; and it does not include the time required to weigh back any feed not eaten. It required 17.6 minutes daily on the average to feed five cows twice a day and 10.4 minutes to feed five cows once a day. On a per-cow basis, the requirements were 3.52 minutes for twice-a-day feeding and 2.07 minutes for once-a-day feeding, which would be 70 percent more time for twice-a-day feeding.

Assuming that larger groups would require the same amount of time per cow as 5 cows, a 20-cow herd would require 70.4 minutes per day for twice-a-day feeding as compared with 41.4 minutes for once-a-day feeding. For a 30-cow herd, approximately 1 hour and 45 minutes would be required for twice-a-day feeding and approximately 1 hour for once-a-day feeding. It is probable, however, that the time per cow would be reduced somewhat as the number of cows increased.

The daily income above cost of feed and cost of labor used in feeding a herd of 20 cows was calculated on the basis of the results obtained in this experiment. The following values, which represented approximate costs at the time the experiment was conducted, were used in making the calculations:

Milk (per hundred pounds) -----	\$5.25
Grain (per ton) -----	80.00
Alfalfa hay (per ton) -----	35.00
Corn silage (per ton) -----	8.00
Labor (per hour) -----	1.00

According to these calculations, a 20-cow herd would return a net income of \$29.51 a day when fed twice a day, as compared with \$28.37 when fed once a day. This increase of \$1.14 a day by feeding twice a day is worth while.

SUMMARY AND CONCLUSIONS

Ten Holstein cows were divided into two groups of comparable age, weight, and stage of lactation and fed once a day and twice a day for three 50-day periods on the double reversal plan. One group received all their day's feed in one feeding in the morning; the other group received half of the day's feed in the morning and half in the afternoon. When the cows were fed twice a day they ate 10 percent more alfalfa hay, produced 6 percent more milk, and required 70 percent more labor for feeding than when they were fed once a day. Theoretically, a 20-cow herd would return a net income above cost of feed and cost of labor used in feeding of \$29.51 a day on twice-a-day feeding, as compared with \$28.37 on once-a-day feeding.

The differences are small but distinctly in favor of twice-a-day feeding, as compared with once-a-day feeding. However, the differences might not be so great if the feeding periods were longer or if an entire herd were shifted to once-a-day feeding. In this event the cows would not be disturbed by the change in routine, and they would soon become adjusted to the routine adopted.

